CPC COOPERATIVE PATENT CLASSIFICATION

E21B EARTH DRILLING, e.g. DEEP DRILLING (mining, quarrying E21C; making shafts, driving galleries or tunnels E21D); OBTAINING OIL, GAS, WATER, SOLUBLE OR MELTABLE MATERIALS OR A SLURRY OF MINERALS FROM WELLS

WARNING

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups:

E21B 1/12 - E21B 1/38	covered by	E21B 1/00
E21B 7/08	covered by	E21B 7/06
E21B 11/04	covered by	E21B 27/00
E21B 23/12	covered by	E21B 23/002
E21B 31/08	covered by	E21B 27/00
E21B 43/22	covered by	C09K 8/58

Methods or apparatus for drilling

1/00 **Percussion drilling** (drives used in the borehole E21B 4/00; rotary drilling machines in general B23B)

1/02 . Surface drives for percussion drilling

1/04 . . Devices for reversing the movement of the rod or cable at the surface {(not used, see E21B 1/02)}

3/00 **Rotary drilling** (drives used in the borehole E21B 4/00; rotary drilling machines in general B23B)

3/02 . Surface drives for rotary drilling

3/025 . . with a to-and-fro rotation of the tool

3/03 . . with an intermittent unidirectional rotation of the tool

3/035 . . with slipping or elastic transmission

3/04 . . Rotary tables {(portable drilling rigs with rotary tables E21B 7/021)}

3/045 . . . {movably mounted on the drilling structure or platform (derricks adapted to be moved on their substructure E21B 15/003; specially adapted for underwater drilling, E21B 15/02)}

2003/05 . . . {with a to-and-fro rotation of the drill pipe or casing}

3/06 . . . Adaptation of rotary draw works to drive rotary tables (connecting or disconnecting couplings or joints E21B 19/16; rope, cable, or chain winding mechanisms, capstans B66D)

4/00 **Drives used in the borehole**

4/003 . {Bearing, sealing, lubricating details (for roller bits E21B 10/22; bearings in general F16C; sealing in general F16J; lubricating in general F16N)}

4/006 . {Mechanical motion converting means, e.g. reduction gearings (E21B 4/10 takes precedence; gearings in general F16H)}

4/02 . Fluid rotary type drives (hydraulic turbines for drilling wells F03B 13/02)

4/04 . Electric drives (E21B 4/12 takes precedence)

4/06 . Down-hole impacting means, e.g. hammers (percussion drill bits E21B 10/36; boring rams E21B 11/02; releasing-jars E21B 31/107)

4/08 . . impact being obtained by gravity only, e.g. with lost-motion connection

4/10 . . continuous unidirectional rotary motion of shaft or drilling pipe effecting consecutive impacts

4/12 . . Electrically operated hammers

4/14 . . Fluid operated hammers

4/145 . . . {of the self propelled-type, e.g. with a reverse mode to retract the device from the hole}

4/16 . Plural down-hole drives, e.g. for combined percussion and rotary drilling (E21B 4/10 takes precedence); Drives for multi-bit drilling units

4/18 . Anchoring or feeding in the borehole

4/20 . combined with surface drive (E21B 4/10 takes precedence)

6/00 **Drives for combined percussion and rotary drilling** (drives used in the borehole E21B 4/00)

6/02 . the rotation being continuous

6/04 . . Separate drives for percussion and rotation

6/06 . the rotation being intermittent, e.g. obtained by ratchet device

6/08 . . Separate drives for percussion and rotation

7/00 **Special methods or apparatus for drilling**

7/001 . {Drilling a non circular hole (excavating trenches E02F 5/02; cutting machines for slitting E21C 25/00)}

7/002 . {Drilling with diversely driven shafts extending into the borehole (simultaneously drilling and casing E21B 7/20; plural down-hole drives E21B 4/16; E21B 7/001 takes precedence)}

7/003 . {Drilling with mechanical conveying means (bailers, e.g. baskets, buckets E21B 27/00; tunnelling E21D)}

7/005 . . {with helical conveying means (E21B 7/201 takes precedence; augers E21B 10/44; drilling rods or pipes with helical structure E21B 17/22)}

7/006 . . . {combined with a bucket-type container (bailers with helical conveying means E21B 27/04)}

7/007 . {Drilling by use of explosives (underwater drilling using explosives E21B 7/1245; setting-tools actuated by explosives E21B 23/04, E21B 23/065; cutting or destroying objects in boreholes by explosives E21B 29/02; freeing objects using explosives E21B 31/1075; gun or shaped-charge perforators E21B 43/116; fracturing by explosives E21B 43/263, E21B 43/248; taking samples using explosives E21B 49/04)}

7/008 . {Drilling ice or a formation covered by ice}

7/02 . Portable drilling rigs, truck-or skid-mounted, with their own drive (portable drilling rigs for use on underwater floors E21B 7/124)

7/021 . . {With a rotary table, i.e. a fixed rotary drive for a relatively advancing tool (rotary tables E21B 3/04)}
7/022 . . {Control of the drilling operation; Hydraulic or pneumatic means for activation or operation (control circuits for drilling masts E21B 15/045)}
7/023 . . {the mast being foldable or telescopically retractable}
7/024 . . {having means for adapting to inclined terrain; having means for stabilizing the vehicle while drilling}
7/025 . . {Rock drills, i.e. jumbo drills}
7/026 . . {having auxiliary platforms, e.g. for observation purposes}
7/027 . . {Drills for drilling shallow holes, e.g. for taking soil samples or for drilling postholes}
7/028 . . . {the drilling apparatus being detachable from the vehicle, e.g. hand portable drills}
7/04 . Directional drilling (derricks or masts specially adapted therefor E21B 15/04)
7/043 . . {for underwater installations}
7/046 . . {horizontal drilling (drilling with mechanical conveying means E21B 7/003)}
7/06 . . Deflecting the direction of boreholes {(directional window cutting E21B 29/06; deflecting the direction of fishing tools E21B 31/14)}
7/061 . . . {the tool shaft advancing relative to a guide, e.g. a curved tube or a whipstock}
7/062 . . . {the tool shaft rotating inside a non-rotating guide travelling with the shaft (E21B 7/067 and E21B 7/068 take precedence)}
7/064 . . . {specially adapted drill bits therefor}
7/065 . . . {using oriented fluid jets}
7/067 . . . {with means for locking sections of a pipe or of a guide for a shaft in angular relation, e.g. adjustable bent sub}
7/068 . . . {drilled by a down-hole drilling motor (down-hole drives per se E21B 4/00, E21B 7/067 takes precedence)}
7/10 . . Correction of deflected boreholes
7/12 . Underwater drilling (derricks or masts specially adapted therefor E21B 15/02; telescoping joints E21B 17/07; using heave compensators E21B 19/09)
7/122 . . {with submersible vertically movable guide}
7/124 . . with underwater tool drive prime mover, e.g. portable drilling rigs for use on underwater floors
7/1245 . . . {using explosive means (Anchors driven in by explosive charges B63B 21/28)}
7/128 . . from floating support with independent underwater anchored guide base {(guide line systems E21B 41/10)}
7/132 . . from underwater buoyant support
7/136 . . from non-buoyant support (E21B 7/124 takes precedence)
7/14 . Drilling by use of heat, e.g. flame drilling {(by use of explosives E21B 7/007)}
7/143 . . {underwater}
7/146 . . {Thermal lances}
7/15 . . of electrically generated heat
7/16 . Applying separate balls or pellets by the pressure of the drill, so-called shot-drilling
7/18 . Drilling by liquid or gas jets, with or without entrained pellets (E21B 7/14 takes precedence; {obtaining a slurry of minerals E21B 43/29}; hydraulic monitors E21C 45/00)
7/185 . . {underwater}
7/20 . Driving or forcing casings or pipes into boreholes, e.g. sinking; Simultaneously drilling and casing boreholes (surface means for applying to-and-fro rotation movements to the casing E21B 3/025; {pushing means outside of the borehole E21B 19/08;} placing piles E02D 7/00; sinking shafts while moving the lining downwards E21D 1/08; {making galleries by forcing prefabricated elements through the ground E21D 9/005})
7/201 . . {with helical conveying means (drilling with helical conveying means E21B 7/005; augers E21B 10/44; drilling rods or pipes with helical structure E21B 17/22)}
7/203 . . . {using down-hole drives (down-hole drives per se E21B 4/00)}
7/205 . . {without earth removal (E21B 7/30 takes precedence)}

NOTE

Special methods or apparatus for drilling without earth removal E21B 7/26

7/206 . . . {using down-hole drives (down-hole drives per se E21B 4/00)}
7/208 . . {using down-hole drives (down-hole drives per se E21B 4/00; E21B 7/203 and E21B 7/206 take precedence)}
7/24 . Drilling using vibrating or oscillating means, e.g. out-of-balance masses (percussion drilling E21B 1/00)
7/26 . Drilling without earth removal, e.g. with self-propelled burrowing devices ({E21B 7/205 and} E21B 7/30 take precedence; down-hole drives E21B 4/00, {e.g. self-propelled fluid-operated hammers E21B 4/145})
7/265 . . {Combined with earth removal}
7/28 . Enlarging drilled holes, e.g. by counterboring (drill bits for enlarging the borehole E21B 10/26)
7/30 . . without earth removal

Drilling tools

10/00 **Drill bits** (specially adapted for deflecting the direction of boring E21B 7/064; with means for collecting substances E21B 27/00)
10/003 . {with cutting edges facing in opposite axial directions}
10/006 . {providing a cutting edge which is self-renewable during drilling}
10/02 . Core bits (characterised by wear resisting parts E21B 10/46; obtaining undisturbed cores E21B 25/00)
10/04 . . with core destroying means
10/06 . . Roller core bits
10/08 . Roller bits (roller core bits E21B 10/06; with leading portion E21B 10/26; characterised by wear resisting parts E21B 10/46)
10/083 . . {with longitudinal axis, e.g. wobbling or nutating roller bit (longitudinal axis roller reamers E21B 10/30)}

10/086 . . {with excentric movement}
10/10 . . with roller axle supported at both ends (with disc-cutters E21B 10/12)
10/12 . . with discs cutters
10/14 . . combined with non-rolling cutters other than of leading-portion type
10/16 . . characterised by tooth form or arrangement
10/18 . . characterised by conduits or nozzles for drilling fluids (drilling fluid supply to the bearings E21B 10/23)
10/20 . . characterised by detachable or adjustable parts, e.g. legs or axles (cross axle roller bits E21B 10/10)
10/22 . . characterised by bearing, lubrication or sealing details
2010/225 . . . {sealing details}
10/23 . . . with drilling fluid supply to the bearings
10/24 . . . characterised by lubricating details
2010/243 . . . . {with drilling fluid supply to the bearing}
10/246 . . . . {with pumping means for feeding lubricant}
10/25 . . . characterised by sealing details
10/26 . Drill bits with leading portion, i.e. drill bits with a pilot cutter; Drill bits for enlarging the borehole, e.g. reamers (percussion drill bits with leading portion E21B 10/40; augers with leading portion E21B 10/44)
10/28 . . with non-expansible roller cutters
10/30 . . . Longitudinal axis roller reamers, e.g. reamer stabilisers
10/32 . . with expansible cutting tools
10/322 . . . {cutter shifted by fluid pressure (E21B 10/345 takes precedence)}
10/325 . . . {the cutter being shifted by a spring mechanism}
10/327 . . . {the cutter being pivoted about a longitudinal axis (E21B 10/34 takes precedence)}
10/34 . . . of roller-cutter type
10/345 . . . . {cutter shifted by fluid pressure}
10/36 . Percussion drill bits (characterised by wear resisting parts E21B 10/46 {with helical conveying portion E21B 10/445})
10/38 . . characterised by conduits or nozzles for drilling fluids
10/40 . . with leading portion
10/42 . Rotary drag type drill bits with teeth, blades or like cutting elements, e.g. fork-type bits, fish tail bits (characterised by wear resisting parts E21B 10/54, by conduits or nozzles for drilling fluid E21B 10/60, by detachable or adjustable parts E21B 10/62)
2010/425 . . {characterised by teeth or cutter arrangement}
10/43 . . characterised by the arrangement of teeth or other cutting elements
10/44 . Bits with helical conveying portion, e.g. screw type bits; Augers with leading portion or with detachable parts ({Rotary drag type drill bits E21B 10/42}; drilling rods with helical structure E21B 17/22)
10/445 . . {percussion type, e.g. for masonry (percussion drill bits in general E21B 10/36)}
10/46 . characterised by wear resisting parts, e.g. diamond inserts {(drill bits with self-renewable cutting edge E21B 10/006)}
10/48 . . the bit being of core type {(saw cylinders having their cutting rim equipped with abrasive particles for drilling stone or glass B28D 1/041)}
10/485 . . . {with inserts in form of chisels, blades or the like}
10/50 . . the bit being of roller type
10/52 . . . with chisel or button type inserts
10/54 . . the bit being of the rotary drag type, e.g. fork-type bits
2010/545 . . . {with blades having performed cutting elements mounted on a distinct support, e.g. polycrystalline inserts}
10/55 . . . with preformed cutting elements {with blades having preformed cutting elements mounted on a distinct support, e.g. polycrystalline inserts}
10/56 . . Button type inserts (E21B 10/52 takes precedence)
2010/561 . . . {Inserts with performed cutting elements mounted on a distinct support, e.g. polycrystalline inserts}
2010/562 . . . . {having a non planar or non circular cutting face}
2010/563 . . . . {having a cutting face with different segments, e.g. mosaic-type inserts}
2010/564 . . . . {characterised by support details}
2010/565 . . . . . {Interface between the substrate and the cutting element}
2010/566 . . . . {with chip breaking arrangements}
10/567 . . . with preformed cutting elements mounted on a distinct support, e.g. polycrystalline inserts
10/5673 . . . . {having a non planar or non circular cutting face}
10/5676 . . . . {having a cutting face with different segments, e.g. mosaic-type inserts}
10/573 . . . . characterised by support details
10/5735 . . . . . {Interface between the substrate and the cutting element}
10/58 . . Chisel type inserts ({E21B 10/485,} E21B 10/52, E21B 10/54 take precedence)
10/60 . characterised by conduits or nozzles for drilling fluids (for roller bits E21B 10/18; for percussion drill bits E21B 10/38; {mining picks with arrangement of fluid-spraying nozzles E21C 35/187})
10/602 . . {the bit being a rotary drag type bit with blades}
10/605 . . {the bit being a core-bit}
2010/607 . . {characterised by the nozzle structure}
10/61 . . characterised by the nozzle structure
10/62 . characterised by parts, e.g. cutting elements, which are detachable or adjustable (E21B 10/64 takes precedence; for roller bits E21B 10/20; {for rotary drag type drill bits E21B 10/42}; for augers E21B 10/44)
2010/622 . . {with plural separable cutter elements}
2010/624 . . . {independently attachable}
10/627 . . with plural detachable cutting elements
10/633 . . . independently detachable
10/64 . characterised by the whole or part thereof being insertable into or removable from the borehole without withdrawing the drilling pipe (retrievable core receivers E21B 25/02)
10/66 . . the cutting element movable through the drilling pipe and laterally shiftable

11/00 Other drilling tools {(boring grabs E21B 27/00)}
11/005 . {Hand operated drilling tools}

11/02 . Boring rams (percussion drives used in the borehole E21B 4/06; percussion drill bits E21B 10/36)
11/06 . with driven cutting chains or similarly driven tools

12/00 Accessories for drilling tools {(connecting and disconnecting drill bit and drilling pipe E21B 19/18; sharpening stone drill bits B24B 3/33)**}**
12/02 . Wear indicators
12/04 . Drill bit protectors
12/06 . Mechanical cleaning devices

Other equipment or details for drilling; Well equipment or well maintenance

15/00 Derricks; Masts; {Other supports (drill rigs with movable understructures E21B 7/02)**}**
15/003 . {adapted to be moved on their substructure, e.g. with skidding means; adapted to drill a plurality of wells (slant-hole rigs E21B 15/04)}
15/006 . {Means for anchoring the drilling machine to the ground}
15/02 . specially adapted for underwater drilling (E21B 15/04 takes precedence; floating drilling platforms B63B 35/44; drilling platforms on legs E02B 17/00; {with skidding means E21B 15/003})
15/04 . specially adapted for directional drilling, e.g. slant hole rigs {(with skidding means E21B 15/003)}
15/045 . . {Hydraulic, pneumatic or electric circuits for their positioning}

17/00 Drilling rods or pipes; Flexible drill strings; Kellies; Drill collars; Sucker rods; {Cables}; Casings; Tubings (rod couplings in general F16D; tubes or tube couplings in general F16L)
17/003 . {with electrically conducting or insulating means (E21B 17/028 and E21B 17/023 take precedence)}
17/006 . {Accessories for drilling pipes, e.g. cleaners (wear protectors E21B 17/10; handling drilling pipes E21B 19/00; thread protectors B65D 59/00)}
17/01 . Risers ({connections between riser sections E21B 17/085; supporting a riser from a drilling or production platform E21B 19/004}; riser connectors {on well heads} E21B 33/038)
17/012 . . {with buoyancy elements (E21B 17/015 takes precedence)}
17/015 . . {Non-vertical risers, e.g. articulated or catenary-type}
17/017 . . {Bend restrictors for limiting stress on risers}
17/02 . Couplings; joints {(Expandable couplings or joints E21B 43/106)}
17/021 . . {Devices for subsurface connecting or disconnecting by rotation (connecting or disconnecting pipe couplings or joints E21B 19/16; fishing tools for frozen rods, casings, ropes, bits or the like E21B 31/00)}
17/023 . . {Arrangements for connecting cables or wirelines to downhole devices}
17/025 . . . {Side entry subs}
17/026 . . . {Arrangements for fixing cables or wirelines to the outside of downhole devices (protectors and centralisers for cables and control lines E21B 17/1035)}
17/028 . . {Electrical or electro-magnetic connections}
17/03 . . between drilling rod or pipe and drill motor, e.g. between drilling rod and hammer
17/04 . . between rod {or the like} and bit or between rod and rod {or the like}
17/042 . . . threaded {(readily releasing joints E21B 17/06)}
17/0423 . . . . {with plural threaded sections, e.g. with two-step threads}
17/0426 . . . . {with a threaded cylindrical portion, e.g. for percussion rods}
17/043 . . . . with locking means
17/046 . . . with ribs, pins or jaws, and complementary grooves or the like, e.g. bayonet catches
17/05 . . . Swivel joints
17/06 . . . Releasing-joints, e.g. safety joints
17/07 . . . Telescoping joints for varying drill string lengths; Shock absorbers (heave compensators in the derrick E21B 19/09; releasing-jars E21B 31/107; {shock-absorbers in general F16F})
17/073 . . . . {with axial rotation}
17/076 . . . . {between rod or pipe and drill bit}
17/08 . . Casing joints
17/085 . . . {Riser connections (connectors for wellhead E21B 33/038)}
17/10 . Wear protectors; Centralising devices, {e.g. stabilisers} (drives used in the borehole with anchoring means E21B 4/18; guiding or centralising devices outside the borehole E21B 19/24)
17/1007 . . {for the internal surface of a pipe, e.g. wear bushings for underwater well-heads}
17/1014 . . {Flexible or expansible centering means, e.g. with pistons pressing against the wall of the well (E21B 17/1042 takes precedence)}
17/1021 . . . {with articulated arms or arcuate springs (measuring the diameter E21B 47/08)}
17/1028 . . . . {with arcuate springs only, e.g. baskets with outwardly bowed strips for cementing operations}
17/1035 . . {for plural rods, pipes or lines, e.g. for control lines}
17/1042 . . {Elastomer protector or centering means}
17/105 . . . {split type}
17/1057 . . {Centralising devices with rollers or with a relatively rotating sleeve (E21B 17/1014 takes precedence)}
17/1064 . . . {Pipes or rods with a relatively rotating sleeve}
17/1071 . . {specially adapted for pump rods, e.g. sucker rods}
17/1078 . . {Stabilisers or centralisers for casing, tubing or drill pipes (devices for off-center positioning E21B 17/10; E21B 17/1007 - E21B 17/1064 take precedence)}
17/1085 . . {Wear protectors; Blast joints; Hard facing (wear protection included in centralising devices, see relevant subgroups)}
17/1092 . . {Gauge section of drill bits}
17/12 . . Devices for placing or drawing out wear protectors
17/14 . Casing shoes {for the protection of the bottom of the casing}
17/16 . Drill collars
17/18 . Pipes provided with plural fluid passages ({E21B 17/203 takes precedence;} circulation of drilling fluid by means of such pipes E21B 21/12; {general F16L 39/00})

17/20 . Flexible or articulated drilling pipes, {e.g. flexible or articulated rods, pipes or cables (risers E21B 17/01; swivel joints E21B 17/05)}
17/203 . . {with plural fluid passages}
17/206 . . {with conductors, e.g. electrical, optical (hoses with electrically conducting means in general F16L 11/127)}
17/22 . Rods or pipes with helical structure (drill bits with helical conveying portion E21B 10/44)

19/00 Handling rods, casings, tubes or the like outside the borehole, e.g. in the derrick (surface drives E21B 1/02, E21B 3/02)
19/002 . {specially adapted for underwater drilling (E21B 19/09, E21B 19/143 take precedence; risers with buoyancy elements E21B 17/012, E21B 17/015)}
19/004 . . {supporting a riser from a drilling or production platform}
19/006 . . . {including heave compensators}
19/008 . {Winding units, specially adapted for drilling operations (capstans, winches B66D; cathead actuated pipe wrenches or spinners E21B 19/162)}
19/02 . Rod or cable suspensions (load-engaging elements for hoisting or lowering purposes in general B66C 1/00; Crown blocks or pulley blocks B66D; cable guides B66D 1/36)
19/04 . . Hooks
19/06 . . Elevators, i.e. rod or tube gripping devices
19/07 . . . Slip-type elevators (slips E21B 19/10)
19/08 . Apparatus for feeding the rods or cables (E21B 19/22 takes precedence; automatic feed E21B 44/02; hoisting drums B66D); Apparatus for increasing or decreasing the pressure on the drilling tool; Apparatus for counterbalancing the weight of the rods
19/081 . . Screw-and-nut feed mechanisms
19/083 . . Cam, rack or like feed mechanisms
19/084 . . with flexible drawing means, e.g. cables
19/086 . . with a fluid-actuated cylinder (E21B 19/084, E21B 19/087, E21B 19/09 take precedence)
19/087 . . by means of a swinging arm
19/089 . . with a spring or an additional weight
19/09 . . specially adapted for drilling underwater formations from a floating support using heave compensators supporting the drill string (drilling-pipe telescoping joints E21B 17/07; {heave compensators for supporting a riser E21B 19/006})
19/10 . Slips; Spiders; {Catching devices (rotary tables with master bushing or kelly bushing E21B 3/04; slip-type elevators E21B 19/07; casing heads with slips E21B 33/0422)}
19/12 . Rope clamps (rope clamps in general F16G 11/00) {rod, casings or tube clamps not secured to elevators}
19/14 . Racks, ramps, troughs or bins, for holding the lengths of rod singly or connected; Handling between storage place and borehole (E21B 19/20, E21B 19/22 take precedence; {storing elongated articles in general B65G 1/0442})
19/143 . . {specially adapted for underwater drilling}
19/146 . . {Carousel systems, i.e. rotating rack systems}
19/15 . . Racking of rods in horizontal position; Handling between horizontal and vertical position
19/155 . . . {Handling between horizontal and vertical position}
19/16 . Connecting or disconnecting pipe couplings or joints (E21B 19/20 takes precedence; Pipe wrenches or the like B25B)
19/161 . . {using a wrench or a spinner adapted to engage a circular section of pipe (E21B 19/168 takes precedence)}
19/162 . . . {cathead actuated}
19/163 . . . {piston-cylinder actuated}
19/164 . . . {motor actuated (E21B 19/162 and E21B 19/163 take precedence)}
19/165 . . {Control or monitoring arrangements therefor}
19/166 . . . {Arrangements of torque limiters or torque indicators}
19/167 . . {using a wrench adapted to engage a non circular section of pipe, e.g. a section with flats or splines}
19/168 . . {using a spinner with rollers or a belt adapted to engage a well pipe}
19/18 . Connecting or disconnecting drill bit and drilling pipe
19/20 . Combined feeding from rack and connecting, e.g. automatically
19/22 . Handling reeled pipe or rod units, e.g. flexible drilling pipes {(lifting or hauling appliances using two or more cooperating endless chains B66D 3/003)}
19/24 . Guiding or centralising devices for drilling rods or pipes

21/00 Methods or apparatus for flushing boreholes, e.g. by use of exhaust air from motor (freeing objects stuck in boreholes by flushing E21B 31/03; well drilling compositions C09K 8/02)
21/001 . {specially adapted for underwater drilling}
21/002 . {Down-hole drilling fluid separation systems (containers comprising collecting means with a strainer E21B 27/005; subsoil filtering E21B 43/02; down-hole production separators E21B 43/38)}
21/003 . {Means for stopping loss of drilling fluid (plastering the borehole wall E21B 33/138)}
2021/005 . {using gaseous fluids}
2021/006 . {Underbalanced techniques, i.e. where borehole fluid pressure is below formation pressure}
2021/007 . {Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes}
2021/008 . . {Means engaging the bore entrance, e.g. hoods for collecting dust}
21/01 . Arrangements for handling drilling fluids or cuttings outside the borehole, e.g. mud boxes ({swivel joints in hose-lines E21B 21/02;} arrangements for treating drilling fluids E21B 21/06; {waste disposal systems E21B 41/005})
21/012 . . {using exhaust air from the drilling motor for blowing off the dust at the borehole entrance}
21/015 . . Means engaging the bore entrance, e.g. hoods for collecting dust
21/02 . Swivel joints in hose-lines {(hose connections in general F16L 31/00, F16L 33/00)}
21/06 . Arrangements for treating drilling fluids outside the borehole (treating steps per se, see the relevant subclasses)
2021/061 . . {for treating dust-loaded gaseous fluids}
21/062 . . {by mixing components}

21/063 . . {by separating components}
21/065 . . . {Separating solids from drilling fluids}
21/066 . . . . {with further treatment of the solids, e.g. for disposal}
21/067 . . . {Separating gases from drilling fluids}
21/068 . . {using chemical treatment}
21/07 . . for treating dust-laden gaseous fluids
21/08 . Controlling or monitoring pressure or flow of drilling fluid, e.g. automatic filling of boreholes, automatic control of bottom pressure (valve arrangements therefor E21B 21/10)
21/10 . Valve arrangements in drilling fluid circulation systems (valves in general F16K)
21/103 . . {Down-hole by-pass valve arrangements, i.e. between the inside of the drill string and the annulus}
21/106 . . {Valve arrangements outside the borehole, e.g. kelly valves}
21/12 . using drilling pipes with plural fluid passages, e.g. closed circulation systems (pipes with plural fluid passages E21B 17/18)
21/14 . using liquids and gases, e.g. foams
21/16 . using gaseous fluids (E21B 21/14 takes precedence; arrangements for handling drilling fluids outside the borehole E21B 21/01; arrangements for treating drilling fluids E21B 21/06)
21/18 . Preventing exhaust air from the drill motor from blowing-off towards the working face

23/00 Apparatus for displacing, setting, locking, releasing, or removing tools, packers or the like in the boreholes or wells (setting of casings, screens or liners E21B 43/10)
23/002 . {Tool diverters, e.g. for through-the-flow line tool systems or for wire-line tools (E21B 23/03 takes precedence; for drilling E21B 7/06)}
23/004 . {Indexing systems for guiding relative movement between telescoping parts of downhole tools}
23/006 . . {"J-slot" systems, i.e. lug and slot indexing mechanisms}
2023/008 . {Self propelling system or apparatus, e.g. for moving tools within the horizontal portion of a borehole}
23/01 . for anchoring the tools or the like (E21B 23/02 - E21B 23/06 take precedence; anchoring of drives in the borehole E21B 4/18; {packers E21B 33/12})
23/02 . for locking the tools or the like in landing nipples or in recesses between adjacent sections of tubing (E21B 23/03 - E21B 23/06 take precedence)
23/03 . for setting the tools into, or removing the tools from, laterally offset landing nipples or pockets
23/04 . operated by fluid means, e.g. actuated by explosion (E21B 23/06, E21B 23/08 take precedence)
23/06 . for setting packers
23/065 . . {setting tool actuated by explosion or gas generating means}
23/08 . Introducing or running tools by fluid pressure, e.g. through-the-flow-line tool systems ({tool diverters E21B 23/002}; special provisions on heads therefor E21B 33/068; cementing plugs E21B 33/16; scrapers operated by fluid pressure E21B 37/04)
23/10 . . Tools specially adapted therefor
23/14 . for displacing a cable or cable-operated tool, e.g. for logging or perforating operations in deviated wells ({side entry sub E21B 17/025; control line protectors E21B 17/1035}; by fluid pressure E21B 23/08; provision on well heads for introducing or removing cable-operated tools E21B 33/072, E21B 33/076)

25/00 Apparatus for obtaining or removing undisturbed cores, e.g. core barrels, core extractors (core bits E21B 10/02; using explosives or projectiles in boreholes E21B 49/04; side-wall sampling or coring E21B 49/06)
25/005 . {Above ground means for handling the core, e.g. for extracting the core from the core barrel}
25/02 . the core receiver being insertable into, or removable from, the borehole without withdrawing the drilling pipe (retrievable drill bits E21B 10/64)
25/04 . . the core receiver having a core forming cutting edge or element, e.g. punch type core barrels
25/06 . the core receiver having a flexible liner or inflatable retaining means
25/08 . Coating, freezing, consolidating cores (E21B 25/06 takes precedence); Recovering uncontaminated cores or cores at formation pressure
25/10 . Formed core retaining or severing means (E21B 25/06, E21B 25/08 take precedence)
25/12 . . of the sliding wedge type
25/14 . . mounted on pivot transverse to core axis
25/16 . for obtaining oriented cores
25/18 . the core receiver being specially adapted for operation under water

27/00 Containers for collecting or depositing substances in boreholes or wells, e.g. bailers, {baskets or buckets} for collecting mud or sand; Drill bits with means for collecting substances, e.g. valve drill bits
27/005 . {Collecting means with a strainer}
27/02 . Dump bailers, i.e. containers for depositing substances, e.g. cement or acids
27/04 . where the collecting or depositing means including helical conveying means {(drilling with helical conveying means combined with bucket-type container E21B 7/006)}

28/00 Vibration generating arrangements for boreholes or wells, e.g. for stimulating production (for drilling E21B 7/24; {for fishing for or freeing objects E21B 31/005}; for transmitting measuring-signals E21B 47/14; for geophysical measurements G01V 1/02)

WARNING

Group E21B 28/00 is not complete. See also E21B 43/003

29/00 Cutting or destroying pipes, packers, plugs, or wire lines, located in boreholes or wells, e.g. cutting of damaged pipes, of windows (perforators E21B 43/11)**; Deforming of pipes in boreholes or wells; Reconditioning of well casings while in the ground {**(by enlarging drilled holes or counterboring E21B 7/28)**}**
29/002 . {Cutting, e.g. milling, a pipe with a cutter rotating along the circumference of the pipe}
29/005 . . {with a radially-expansible cutter rotating inside the pipe, e.g. for cutting an annular window}

29/007 . . {with a radially-retracting cutter rotating outside the pipe}
29/02 . by explosives or by thermal or chemical means ({freeing stuck objects by explosives E21B 31/002}; destroying objects in boreholes or wells by explosives E21B 31/16)
29/04 . Cutting of wire lines or the like (E21B 29/02 takes precedence)
29/06 . Cutting windows, e.g. directional window cutters for whipstock operations ({E21B 29/005 and} E21B 29/08 take precedence {; whipstocks E21B 7/061})
29/08 . Cutting or deforming pipes to control fluid flow (shear type blow-out preventers E21B 33/063)
29/10 . Reconditioning of well casings, e.g. straightening
29/12 . specially adapted for underwater installations (E21B 29/08 takes precedence)

31/00 Fishing for or freeing objects in boreholes or wells ({using junk baskets or the like E21B 27/00}; provisions on well heads for introducing or removing objects E21B 33/068; Locating or determining the position of objects in boreholes or wells E21B 47/09)
31/002 . {Destroying the objects to be fished, e.g. by explosive means (cutting by explosives E21B 29/02)}
31/005 . {using vibrating or oscillating means (vibration generating arrangements for boreholes or wells E21B 28/00)}
31/007 . {fishing tools with means for attaching comprising fusing or sticking}
31/03 . Freeing by flushing; {Controlling differential pipe sticking}
31/06 . using magnetic means
31/107 . using impact means for releasing stuck parts, e.g. jars (telescoping joints E21B 17/07)
31/1075 . . {using explosives}
31/113 . . hydraulically-operated
31/1135 . . . {Jars with a hydraulic impedance mecanism, i.e. a restriction, for initially delaying escape of a restraining fluid}
31/12 . Grappling tools, e.g. tongs or grabs
31/125 . . {specially adapted for parted wire line or ropes}
31/14 . . with means deflecting the direction of the tool, e.g. by use of knuckle joints (apparatus for deflecting the boring E21B 7/06)
31/16 . . combined with cutting or destroying means (cutting or destroying means per se E21B 29/00)
31/18 . . gripping externally, e.g. overshot
31/20 . . gripping internally, e.g. fishing spears

33/00 Sealing or packing boreholes or wells
2033/005 . {Sealings characterised by their shape}
33/02 . Surface sealing or packing
33/03 . . Well heads; Setting-up thereof (valve arrangements therefor E21B 34/02)
33/035 . . . specially adapted for underwater installations (E21B 33/043, E21B 33/064, E21B 33/076 take precedence)
33/0355 . . . . {Control systems, e.g. hydraulic, pneumatic, electric, acoustic, for submerged well heads}
33/037 . . . . Protective housing therefor
33/0375 . . . . . {Corrosion protection means (in general C23F)}
33/038 . . . . Connectors used on well heads, e.g. for connecting blow-out preventer and riser (connecting a production flow-line to an underwater well head E21B 43/013)
33/0385 . . . . . {electrical connectors (underwater electrical connections in general H01R 13/523)}
33/04 . . . Casing heads; Suspending casings or tubings in well heads (setting of casings in wells E21B 43/10)
33/0407 . . . . {with a suspended electrical cable}
33/0415 . . . . {rotating or floating support for tubing or casing hanger}
33/0422 . . . . {a suspended tubing or casing being gripped by a slip or an internally serrated member (slips in rotary table E21B 19/10)}
33/043 . . . . specially adapted for underwater well heads ({E21B 33/0407,} E21B 33/047 take precedence)
33/047 . . . . for plural tubing strings
33/05 . . . . Cementing-heads, e.g. having provision for introducing cementing plugs
33/06 . . . Blow-out preventers, {i.e. apparatus closing around a drill pipe, e.g. annular blow-out preventers (rotating blow-out preventers E21B 33/085; valves E21B 34/00)}
33/061 . . . . {Ram-type blow-out preventers, e.g. with pivoting rams}
33/062 . . . . . {with sliding rams}
33/063 . . . . . {for shearing drill pipes (cutting of wireline E21B 29/04; cutting pipes E21B 29/08)}
33/064 . . . . specially adapted for underwater well heads (connectors therefor E21B 33/038; {control systems for submerged well-heads E21B 33/0355})
33/068 . . . having provision for introducing objects or fluids into, or removing objects from, wells (cementing heads E21B 33/05; {wipers, oil savers E21B 33/08})
33/072 . . . . for cable-operated tools (E21B 33/076 takes precedence)
33/076 . . . . specially adapted for underwater installations
33/08 . . Wipers; Oil savers
33/085 . . . {Rotatable packing means, e.g. rotating blow-out preventers}
33/10 . in the borehole {(sealing the junction between main bore and laterals E21B 41/0042)}
2033/105 . . {characterised by sealing the junction between a lateral and a main bore}
33/12 . . Packers; Plugs ({locking packers or plugs in landing nipples E21B 23/02}; used for cementing E21B 33/134, E21B 33/16)
33/1204 . . . {permanent; drillable}
33/1208 . . . {characterised by the construction of the sealing or packing means (E21B 33/1277 takes precedence)}
33/1212 . . . . {including a metal-to-metal seal element}
33/1216 . . . . {Anti-extrusion means, e.g. means to prevent cold flow of rubber packing}
33/122 . . . Multiple string packers
33/124 . . . Units with longitudinally-spaced plugs for isolating the intermediate space
33/1243 . . . . {with inflatable sleeves}

33/1246 . . . . . {inflated by down-hole pumping means operated by a pipe string}
33/126 . . . with fluid-pressure-operated elastic cup or skirt (E21B 33/122, E21B 33/124 take precedence)
33/1265 . . . . {with mechanical slips}
33/127 . . . with inflatable sleeve (E21B 33/122, E21B 33/124 take precedence)
33/1272 . . . . {inflated by down-hole pumping means operated by a pipe string}
33/1275 . . . . {inflated by down-hole pumping means operated by a down-hole drive}
33/1277 . . . . {characterised by the construction or fixation of the sleeve}
33/128 . . . with a member expanded radially by axial pressure (E21B 33/122, E21B 33/124, {E21B 33/129} take precedence; {characterised by the construction of the sealing means E21B 33/1208})
33/1285 . . . . {by fluid pressure}
33/129 . . . with mechanical slips for hooking into the casing (E21B 33/122, E21B 33/124 take precedence)
33/1291 . . . . {anchor set by wedge or cam in combination with frictional effect, using so-called drag-blocks (E21B 33/1295 takes precedence)}
33/1292 . . . . . {with means for anchoring against downward and upward movement}
33/1293 . . . . {with means for anchoring against downward and upward movement (E21B 33/1291, E21B 33/1295 take precedence)}
33/1294 . . . . {characterised by a valve, e.g. a by-pass valve}
33/1295 . . . . actuated by fluid pressure
33/12955 . . . . . {using drag blocks frictionally engaging the inner wall of the well}
33/13 . . Methods or devices for cementing, for plugging holes, crevices, or the like (dump bailers E21B 27/02; {methods or apparatus for grouting offshore structures E02B 17/0008} chemical compositions therefor C09K 8/00)
33/134 . . . Bridging plugs {(packers E21B 33/12)}
33/136 . . . Baskets, e.g. of umbrella type
33/138 . . . Plastering the borehole wall; Injecting into the formations {(packers E21B 33/12; consolidation of loose sand or the like round the wells without excessively decreasing the permeability thereof E21B 43/025, compositions therefor C09K 8/56)}
33/14 . . . for cementing casings into boreholes {(using special cement compositions C09K 8/42; control of cementation quality or level E21B 47/0005)}
33/143 . . . . {for underwater installations}
33/146 . . . . {Stage cementing, i.e. discharging cement from casing at different levels}
33/16 . . . . using plugs for isolating cement charge; Plugs therefor {(spacer compositions C09K 8/424; stage cementing E21B 33/146)}

34/00 **Valve arrangements for boreholes or wells** (in drilling fluid circulation systems E21B 21/10; {tool diverters E21B 23/002;} blow-out preventers E21B 33/06; oil flow regulating apparatus E21B 43/12; valves in general F16K)
2034/002 . {Ball valves}
2034/005 . {Flapper valves}
2034/007 . {Sleeve valves}
34/02 . in well heads
34/04 . . in underwater well heads
34/045 . . . {adapted to be lowered on a tubular string into position within a blow-out preventer stack, e.g. so-called test trees}
34/06 . in wells
34/063 . . {Valve or closure with destructible element, e.g. frangible disc (E21B 34/103 takes precedence)}
34/066 . . {electrically actuated}
34/08 . . responsive to flow or pressure of the fluid obtained (E21B 34/10 takes precedence)
34/085 . . . {with time-delay systems, e.g. hydraulic impedance mechanisms}
34/10 . . operated by control fluid supplied from above ground ({by a dropped ball or piston E21B 34/14;} above-ground control means E21B 34/16)
34/101 . . . {with means for equalizing fluid pressure above and below the valve}
34/102 . . . {with means for locking the closing element inopen or closed position (E21B 34/105 and E21B 34/108 take precedence)}
34/103 . . . . {with a shear pin}
34/105 . . . {retrievable, e.g. wire line retrievable, i.e. with an element which can be landed into a landing-nipple provided with a passage for control fluid}
34/106 . . . . {the retrievable element being a secondary control fluid actuated valve landed into the bore of a first inoperative control fluid actuated valve}
34/107 . . . . {the retrievable element being an operating or controlling means retrievable separately from the closure member, e.g. pilot valve landed into a side pocket (E21B 34/106 takes precedence)}
34/108 . . . {with time delay systems, e.g. hydraulic impedance mechanisms}
34/12 . . operated by movement of casings or tubings
34/125 . . . {with time delay systems, e.g. hydraulic impedance mechanisms}
34/14 . . operated by movement of tools, e.g. sleeve valves operated by pistons or wire line tools {(E21B 34/066 takes precedence)}
34/16 . Above-ground control means therefor {(control systems for submerged well heads E21B 33/0355)}

35/00 **Methods or apparatus for preventing or extinguishing fires** (cutting or deforming pipes to control fluid flow E21B 29/08; controlling flow of fluid to or in wells E21B 43/12; fire fighting in general A62C, A62D)

36/00 **Heating, cooling, insulating arrangements for boreholes or wells, e.g. for use in permafrost zones** (drilling by use of heat E21B 7/14; secondary recovery methods using heat E21B 43/24)

36/001 . {Cooling arrangements}
36/003 . {Insulating arrangements}
36/005 . {Heater surrounding production tube}
36/006 . {Combined heating and pumping means}
36/008 . {using chemical heat generating means}
36/02 . using burners
36/025 . . {the burners being above ground or outside the bore hole}
36/04 . using electrical heaters

37/00 **Methods or apparatus for cleaning boreholes or wells** (E21B 21/00 takes precedence; {bailers E21B 27/00;} cleaning pipes in general B08B 9/02)
37/02 . Scrapers specially adapted therefor
37/04 . . operated by fluid pressure, e.g. free-piston scrapers (operating other tools by fluid pressure E21B 23/08)
37/045 . . . {Free-piston scrapers}
37/06 . using chemical means for preventing, limiting {or eliminating} the deposition of paraffins or like substances (chemical compositions therefor C09K 8/52)
37/08 . cleaning in situ of down-hole filters, screens, {e.g. casing perforations,} or gravel packs (E21B 37/06 takes precedence)
37/10 . Well swabs {(pistons in general F16J)}

40/00 **Tubing catchers, automatically arresting the fall of oil-well tubing {**(preventing small objects from falling into the borehole E21B 41/0021)**}**

41/00 **Equipment or details not covered by groups E21B 15/00 - E21B 40/00**
41/0007 . {for underwater installations (E21B 41/005, E21B 41/04, E21B 41/06, E21B 41/08, E21B 41/10 take precedence)}
41/0014 . . {Underwater well locating or reentry systems}
41/0021 . {Safety devices, e.g. for preventing small objects from falling into the borehole}
2041/0028 . {Fuzzy logic, artificial intelligence, neural networks, or the like}
41/0035 . {Apparatus or methods for multilateral well technology, e.g. for the completion of or workover on wells with one or more lateral branches (whipstocks E21B 7/061; tool diverters E21B 23/002; cutting casing windows E21B 29/06; specific well pattern E21B 43/30)}
41/0042 . . {characterised by sealing the junction between a lateral and a main bore}
41/005 . {Waste disposal systems (treatment of drilling fluid outside the borehole E21B 21/06; collecting oil or the like from a submerged leakage E21B 43/0122)}
41/0057 . . {Disposal of a fluid by injection into a subterranean formation}
41/0064 . . . {Carbon dioxide sequestration (storing fluids in porous layers B65G 5/005)}
41/0071 . . {Adaptation of flares, e.g. arrangements of flares in offshore installations (flares of waste gases or noxious gases F23G 7/08)}
41/0078 . {Nozzles used in boreholes (drilling by liquid or gas jets E21B 7/18; drill bits with nozzles E21B 10/60; perforators using direct fluid action E21B 43/114; obtaining a slurry of minerals using nozzles E21B 43/29; nozzles in general B05B)}
41/0085 . {Adaptations of electric power generating means for use in boreholes (generation of electric power per se H02)}
41/0092 . {Methods relating to program engineering, design or optimisation}
41/02 . in situ inhibition of corrosion in boreholes or wells (dump bailers E21B 27/02; chemical compositions therefor C09K 8/54; inhibiting corrosion in general C23F)
41/04 . Manipulators for underwater operations, e.g. temporarily connected to well heads (manipulators in general B25J)
41/06 . Work chambers for underwater operations, e.g. temporarily connected to well heads (in general B63C 11/00)
41/08 . Underwater guide bases, e.g. drilling templates; Levelling therefor

WARNING

This group was introduced in January 2000. Patent documents are continuously being reclassified to this group from groups E21B 7/12, E21B 33/035, E21B 43/017

41/10 . Guide posts, e.g. releasable; Attaching guide lines to underwater guide bases

Obtaining fluids from wells

43/00 **Methods or apparatus for obtaining oil, gas, water, soluble or meltable materials or a slurry of minerals from wells** (applicable only to water E03B; obtaining oil-bearing deposits or soluble or meltable materials by mining techniques E21C 41/00; pumps F04)
43/003 . {Vibrating earth formations (vibration generating arrangements for boreholes or wells E21B 28/00)}
43/006 . {Production of coal-bed methane (E21B 43/243 takes precedence; methods or devices for drawing-off gases for safety purposes in mines E21F 7/00)}
43/01 . specially adapted for obtaining from underwater installations (underwater well heads E21B 33/035)
43/0107 . . {Connecting of flow lines to offshore structures (E21B 43/013 takes precedence)}
2043/0115 . . {Drilling for or production of natural gas hydrate reservoirs; Drilling through or monitoring of formations containing gas hydrates}
43/0122 . . {Collecting oil or the like from a submerged leakage (cleaning or keeping clear the surface of open water from oil or the like E02B 15/04)}
43/013 . . connecting a production flow line to an underwater well head
43/0135 . . . {using a pulling cable}
43/017 . . Production satellite stations, i.e. underwater installations comprising a plurality of satellite well heads connected to a central station (underwater separating arrangements E21B 43/36)
43/02 . Subsoil filtering (E21B 43/11 takes precedence, chemical compositions for consolidating loose sand or the like around wells C09K 8/56)
43/025 . . {Consolidation of loose sand or the like round the wells without excessively decreasing the permeability thereof (sealing borehole walls E21B 33/138)}
43/04 . . Gravelling of wells

43/045 . . . {Crossover tools}
43/08 . . Screens or liners {(expandable screens or liners E21B 43/108; obtaining drinking water; filters E03B 3/18)}
43/082 . . . {Screens comprising porous materials, e.g. prepacked screens}
43/084 . . . {Screens comprising woven materials, e.g. mesh or cloth}
43/086 . . . {Screens with preformed openings, e.g. slotted liners (comprising porous materials E21B 43/082)}
43/088 . . . {Wire screens (comprising porous materials E21B 43/082; comprising woven materials E21B 43/084)}
43/10 . . Setting of casings, screens, liners {or the like} in wells (driving or forcing casings into boreholes, simultaneously drilling and casing boreholes E21B 7/20; setting of tools, packers or the like E21B 23/00; suspending casings in well heads E21B 33/04)
43/101 . . . {for underwater installations}
43/103 . . . {of expandable casings, screens, liners, or the like}
43/105 . . . . {Expanding tools specially adapted therefor}
43/106 . . . . {Couplings or joints therefor}
43/108 . . . . {Expandable screens or liners}
43/11 . Perforators; Permeators
43/112 . . Perforators with extendable perforating members, e.g. actuated by fluid means
43/114 . . Perforators using direct fluid action {on the wall to be perforated}, e.g. abrasive jets
43/116 . . Gun or shaped charge perforators {(projectiles with shaped or hollow charge F42B 12/10)}
43/117 . . . Shaped charge perforators (E21B 43/118 takes precedence)
43/118 . . . characterised by lowering in vertical position and subsequent tilting to operating position
43/1185 . . . Ignition systems
43/11852 . . . . {hydraulically actuated}
43/11855 . . . . {mechanically actuated, e.g. by movement of a wireline or a drop-bar (E21B 43/11852 takes precedence)}
43/11857 . . . . {firing indication systems}
43/119 . . Details, e.g. for locating perforating place or direction
43/1195 . . . {Replacement of drilling mud; decrease of undesirable shock waves}
43/12 . Methods or apparatus for controlling the flow of the obtained fluid to or in wells (E21B 43/25 takes precedence; valve arrangements E21B 34/00)
43/121 . . {Lifting well fluids (survey of down-hole pump systems E21B 47/0007)}
43/122 . . . {Gas lift}
43/123 . . . . {Gas lift valves}
43/124 . . . {Adaptation of jet-pump systems}
2043/125 . . . {Adaptation of walking-beam pump systems}
43/126 . . . {Adaptations of down-hole pump systems powered by drives outside the borehole, e.g. by a rotary or oscillating drive (powered by fluid E21B 43/129)}
43/127 . . . . {Adaptations of walking-beam pump systems}
43/128 . . . {Adaptation of pump systems with down-hole electric drives}
43/129 . . . {Adaptations of down-hole pump systems powered by fluid supplied from outside the borehole (gas-lift E21B 43/122; jet pumps E21B 43/124)}
43/14 . Obtaining from a multiple-zone well
43/16 . Enhanced recovery methods for obtaining hydrocarbons (fracturing E21B 43/26; obtaining slurry E21B 43/29; reclamation of contaminated soil in situ B09C; {chemical compositions therefor C09K 8/58})
43/162 . . {Injecting fluid from longitudinally spaced locations in injection well}
43/164 . . {Injecting CO_2 or carbonated water (in combination with organic material C09K 8/594)}
43/166 . . {Injecting a gaseous medium; Injecting a gaseous medium and a liquid medium (CO_2 injection E21B 43/164; steam injection E21B 43/24)}
43/168 . . . {Injecting a gaseous medium}
43/17 . . Interconnecting two or more wells by fracturing or otherwise attacking the formation ({E21B 43/2405,} E21B 43/247 take precedence)
43/18 . . Repressuring or vacuum methods
43/20 . . Displacing by water
43/24 . . using heat, e.g. steam injection (heating, cooling or insulating wells E21B 36/00 {; in combination with organic material C09K 8/592})
43/2401 . . . {by means of electricity}
43/2403 . . . {by means of nuclear energy (nuclear reactors G21)}
43/2405 . . . {in association with fracturing or crevice forming processes (E21B 43/247 takes precedence)}
43/2406 . . . {Steam assisted gravity drainage [SAGD]}
43/2408 . . . . {SAGD in combination with other methods}

WARNING

Not complete pending a reorganisation. See also E21B 43/24 and subgroups

43/241 . . . combined with solution mining of non-hydrocarbon minerals, e.g. solvent pyrolysis of oil shale
43/243 . . . Combustion in situ
43/247 . . . . in association with fracturing processes {or crevice forming processes}
43/248 . . . . . using explosives
43/25 . Methods for stimulating production (dump bailers E21B 27/02; vibration generating arrangements E21B 28/00 {; by vibrating earth formations E21B 43/003}; chemical compositions therefor C09K 8/60)
43/255 . . {including the injection of a gaseous medium as treatment fluid into the formation}
43/26 . . by forming crevices or fractures {(chemical compositions therefor C09K 8/62)}
43/261 . . . {Separate steps of (1) cementing, plugging or consolidating and (2) fracturing or attacking the formation}
43/263 . . . using explosives {(Combustion in situ using explosives E21B 43/248)}
43/2635 . . . . {by means of nuclear energy (peaceful applications of nuclear explosive devices in general G21J 3/00)}
43/267 . . . reinforcing fractures by propping {(chemical compositions therefor C09K 8/80)}

43/28 . Dissolving minerals other than hydrocarbons, e.g. by an alkaline or acid leaching agent (E21B 43/241 takes precedence; {using steerable or laterally extendable nozzles E21B 43/292})

43/281 . . {using heat (heating, cooling or insulating wells E21B 36/00)}

43/283 . . {in association with a fracturing process}

43/285 . Melting minerals, e.g. sulfur (E21B 43/24 takes precedence; heating, cooling or insulating arrangements for wells E21B 36/00)

43/29 . Obtaining a slurry of minerals, e.g. by using nozzles

43/292 . . {using steerable or laterally extendable nozzles}

43/295 . Gasification of minerals, e.g. for producing mixtures of combustible gases (E21B 43/243 takes precedence)

43/30 . Specific pattern of wells, e.g. optimizing the spacing of wells (production satellite stations E21B 43/017)

43/305 . . {comprising at least one inclined or horizontal well}

43/32 . Preventing gas- or water- coning phenoma, i.e. the formation of a conical column of gas or water around wells

43/34 . Arrangements for separating materials produced by the well (separating apparatus per se, see the relevant subclasses)

43/36 . . Underwater separating arrangements (E21B 43/38 takes precedence)

43/38 . . in the well

43/385 . . . {by reinjecting the separated materials into an earth formation in the same well}

43/40 . . Separation associated with re-injection of separated materials {(E21B 43/385 takes precedence)}

Automatic control, surveying or testing

44/00 Automatic control systems specially adapted for drilling operations, i.e. self-operating systems which function to carry out or modify a drilling operation without intervention of a human operator, e.g. computer-controlled drilling systems (for non-automatic drilling control, see the operation controlled; automatic feeding from rack and connecting of drilling pipes E21B 19/20; controlling pressure or flow of drilling fluid E21B 21/08; control systems in general G05)**; Systems specially adapted for monitoring a plurality of drilling variables or conditions** (means for transmitting measuring-signals from the well to the surface E21B 47/12)

44/005 . {Below-ground automatic control systems}

44/02 . Automatic control of the tool feed ({E21B 44/005}, E21B 44/10 take precedence)

44/04 . . in response to the torque of the drive; {Measuring drilling torque (E21B 44/06 takes precedence; measuring stresses in a well bore pipe E21B 47/0006)}

44/06 . . in response to the flow or pressure of the motive fluid of the drive

44/08 . . in response to the amplitude of the movement of the percussion tool, e.g. jump or recoil

44/10 . Arrangements for automatic stopping when the tool is lifted from the working face {(informative reference: arrangements for automatic stopping for portable percussive tools B25D 9/265)}

45/00 Measuring the drilling time or rate of penetration

47/00 Survey of boreholes or wells (monitoring pressure or flow of drilling fluid E21B 21/08; geophysical logging G01V)

47/0001 . {for underwater installations}

47/0002 . {Survey of boreholes or wells by visual inspection (photographing internal surfaces, e.g. of pipes G03B 37/005; closed circuit television systems H04N 7/18)}

47/0003 . {Determining well or borehole volumes (determining depth E21B 47/04, diameter E21B 47/08; measuring volumes in general G01F)}

47/0005 . {control of cementation quality or level (measuring temperature E21B 47/065)}

47/0006 . {Measuring stresses in a well bore pipe string or casing (for locating stuck pipe E21B 47/09)}

47/0007 . {Survey of down-hole pump systems}

47/0008 . . {Survey of walking-beam pump systems, e.g. for the detection of so called "pumped-off" conditions}

47/01 . Devices for supporting measuring instruments on a drill pipe, rod or wireline (setting or locking tools in boreholes or wells E21B 23/00); {(flexible centering means per se E21B 17/1014)} Protecting measuring instruments in boreholes against heat, shock, pressure or the like

NOTE

Devices for both supporting and protecting measuring instruments are only classified in E21B 47/011

47/011 . . {Protecting measuring instruments (cooling or insulating arrangements for boreholes or wells E21B 36/00)}

47/02 . Determining slope or direction (clinometers or direction meters G01C)

47/022 . . of the borehole, {e.g. using geomagnetism}

47/02208 . . . {using seismic or acoustic means}

47/02216 . . . {using at least one source of electromagnetic energy and at least one detector therefor}

47/02224 . . . . {at least one of the sources or one of the detectors being located above ground}

47/02232 . . . {using a pendulum}

47/024 . . of devices in the borehole (E21B 47/022 takes precedence)

47/026 . . of penetrated ground layers (apparatus for obtaining oriented cores E21B 25/16; formation testing E21B 49/00)

47/04 . Measuring depth or liquid level (measuring liquid level in general {and telerecorders for level of liquids} G01F; {measuring depth in general G01B 7/26})

47/042 . . {Measuring or locating liquid level (E21B 47/044 takes precedence)}

47/044 . . {using radioactive markers}

47/06 . Measuring temperature or pressure (measuring temperature in general G01K; measuring pressure in general G01L {telerecorders for pressure G01L; telerecorders for temperature G01K})

47/065 . . {Measuring temperature}

47/08 . Measuring the diameter (measuring diameter in general G01B)

47/082 . . {using radiant means, e.g. acoustic, radioactive, electromagnetic}

47/09 . Locating or determining the position of objects in boreholes or wells, {e.g. the position of an extending arm}; Identifying the free or blocked portions of pipes (measuring depth E21B 47/04; measuring diameter E21B 47/08)

47/0905 . . {by detecting magnetic anomalies (investigating materials by investigating magnetic variables G01N 27/72)}

47/091 . . {by detecting an acoustic anomaly, e.g. a mud-pressure pulse}

47/0915 . . {using impression packers, e.g. to detect recesses or perforations}

47/10 . Locating fluid leaks, intrusions or movements {(using impression packers E21B 47/0915; flow measurement in general G01F; examining density and leaking in general G01M)}

47/1005 . . {using thermal measurements (measurement temperature E21B 47/065)}

47/101 . . {using acoustic energy}

47/1015 . . {using tracers: using radioactivity}

47/102 . . {using electrical indications: using light radiations}

47/1025 . . {Detecting leaks, e.g. of tubing, by pressure testing (investigating fluid-tightness of structures by using fluid or vacuum G01M 3/02)}

47/12 . Means for transmitting measuring-signals {or control signals} from the well to the surface {or from the surface to the well}, e.g. for logging while drilling (remote signalling in general G08)

47/121 . . {using earth as an electrical conductor (E21B 47/122 takes precedence; in general H04B 13/02; electric prospecting G01V 3/00)}

47/122 . . {by electromagnetic energy, e.g. radio frequency (in general H04B magnetic propspecting G01V 3/00)}

47/123 . . . {using light waves (optical transmission in general H04B 10/00; light guides, e.g. optical fibres G02B 6/00)}

47/124 . . {Storing data down-hole, e.g. in a memory or on a record carrier (recording in connection with measuring in general G01D; information storage in general G11)}

47/14 . . using acoustic waves

47/16 . . . through the drill string or casing, {e.g. by torsional acoustic waves}

47/18 . . . through the well fluid, {e.g. mud pressure pulse telemetry}

47/182 . . . . {by continuous mud waves with modulation of the waves}

47/185 . . . . {by negative mud pulses using a pressure relieve valve between drill pipe and annulus}

47/187 . . . . {by positive mud pulses using a flow restricting valve within the drill pipe}

49/00 Testing the nature of borehole walls; Formation testing; Methods or apparatus for obtaining samples of soil or well fluids, specially adapted to earth drilling or wells (sampling in general G01N 1/00)

49/001 . {specially adapted for underwater installations}

49/003 . {by analysing drilling variables or conditions (E21B 49/005 takes precedence; Systems specially adapted for monitoring a plurality of drilling variables or conditions E21B 44/00)}

49/005 . {Testing the nature of borehole walls or the formation by using drilling mud or cutting data (investigating chemical or physical properties of materials per se G01N)}

49/006 . {Measuring wall stresses in the borehole (investigation of mechanical properties of foundation soil E02D 1/022)}

49/008 . {by injection test; by analysing pressure variations in an injection or production test, e.g. for estimating the skin factor (measuring pressure E21B 47/06; obtaining fluid samples or testing fluids E21B 49/08)}

49/02 . by mechanically taking samples of the soil (apparatus for obtaining undisturbed cores E21B 25/00; investigation of foundation soil in situ E02D 1/00)

49/025 . . {of underwater soil, e.g. with grab devices (underwater coring E21B 25/18)}

49/04 . . using explosives in boreholes; using projectiles penetrating the wall {(drilling by use of explosives E21B 7/007; gun or shaped charge perforators E21B 43/116)}

49/06 . . with side-wall drilling tools {pressing} or scrapers

49/08 . Obtaining fluid samples or testing fluids, in boreholes or wells {(packers E21B 33/12; valves E21B 34/00; analysing pressure variations in an injection or production test E21B 49/008)}

49/081 . . {with down-hole means for trapping a fluid sample (E21B 49/10 takes precedence)}

49/082 . . . {Wire-line fluid samplers (E21B 49/083 takes precedence)}

49/083 . . . {Samplers adapted to be lowered into or retrieved from a landing nipple, e.g. for testing a well without removing the drill string}

49/084 . . {with means for conveying samples through pipe to surface}

2049/085 . . {Determining specific physical fluid parameters}

49/086 . . {Withdrawing samples at the surface}

49/087 . . {Well testing, e.g. testing for reservoir productivity or formation parameters}

49/088 . . . {combined with sampling}

49/10 . . using side-wall fluid samplers or testers